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COMPLETED

PROGRAM ANNOUNCEMENT

National Science Foundation

National Institute of Education

OF

THE IMPROVEMENT OF MATHEMATICS EDUCATION USING INFORMATION TECHNOLOGY

Closing Dates*
February 14, 1980
August 19, 1980
(see inside front cover)

National Science Foundation
Division of Science Education
Development and Research
Washington, D.C. 20550

The National
Institute of
Education
U.S. Department of
Health, Education and Welfare
Washington, D.C. 20208

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*CLOSING DATES

This announcement is intended for use in Fiscal Year 1980 and Fiscal Year 1981, subject to the availability of funds.

It is likely that there will be substantially less money to support proposals submitted at the second deadline (August 19, 1980). A statement will be published on or about May 15, 1980, containing any additional information that proposers for the second deadline should consider. People who wish to receive that statement should send two self-addressed gummed labels to:

Second Deadline Information
Mail Stop #7
National Institute of Education
Washington, D.C. 20208

(This will not include an announcement of awards made for the first deadline.)

In addition to support of the prototypes described in this guideline, NSF, through its Science Education Development and Research Programs, will consider support for other activities to identify problems, opportunities, and possible directions for further work in mathematics education using information technology. For such purposes, a two- or three-page letter, describing the activity, may be submitted to NSF at any time at the address below:

Mathematics Education Using
Information Technology
Division of Science Education
Development and Research
National Science Foundation
Washington, D.C. 20550

(Telephone: 202/282-7910)

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NSF-NIE PROGRAM - THE IMPROVEMENT OF MATHEMATICS EDUCATION USING INFORMATION TECHNOLOGY

INSTRUCTIONS FOR PREPARATION AND SUBMISSION OF PROPOSALS

I. PURPOSE AND ELIGIBILITY

The National Institute of Education (NIE) and the National Science Foundation (NSF) are initiating a joint program of development and research to improve the teaching and learning of school mathematics through the use of modern information-handling technology. The purpose is to capitalize on the strengths and the vision of investigators as to how modern information-handling devices can best facilitate the instructional process in mathematics.

The current revolution in availability, at low cost, of sophisticated information-handling technology, including personal computers and video recorders and players, may provide important new means of aiding teachers to broaden and deepen mathematics instruction, including testing and applications to everyday life and to science. We now have the potential to adapt instruction to the needs and difficulties of individual students. New understanding of cognitive processes and of the important effects of the social context of teaching and learning may enhance the effectiveness and acceptability of technologically based aids to instruction.

Program Objectives. Primary emphasis in the program is on the development of prototypes of (1) educationally relevant software, (2) instructional courseware, and (3) methods for assessing students' progress. These should respond to pedagogical needs and opportunities, and be developed with the involvement of students and teachers and appropriately modified on the basis of experience. Associated research aimed at improving our knowledge of mathematics teaching and learning processes is an essential element in the program.

Two concerns inform the development and operation of this program. First is a need to devise ways of using new information-handling technology to reduce existing inequalities in educational performance. Secondly, the development of prototypes must proceed from the outset with a concern for assuring the successful adaptation of new technology in classrooms.

It is planned that, subject to availability of funds, this program will be continued for several years. The objective of the first year's competition is to support projects lasting from 12 to 18 months for development of a variety of innovative and imaginative approaches to mathematics instruction using information technology. By "approaches" is meant ways of structuring and presenting mathematical content. These approaches, together with existing models, may form the basis for a smaller number of larger projects selected in open competition in later years. The emphasis of the program is on the application of innovative approaches to mathematical content, rather than on the expansion of well developed methods, such as drill-and-practice, to new content. Thus projects designed to produce, during their first year, working models (from which a student can learn some mathematics) that clearly illustrate the new approach are particularly appropriate.

Proposals should seek to capitalize on the strengths and vision of the principal investigators as to how modern information-handling devices can best facilitate the instructional process in mathematics. One project might be teacher-centered, while another might involve small groups of students exploring a computer-generated environment, solving problems cooperatively, with the teacher as an occasional guide or resource. One project might emphasize a more or less standard curriculum and use the information technology for more effective instruction, while another might explore an alternative curriculum. Modification of existing hardware may be necessary to meet the instructional objectives of a project. These examples are meant to be illustrative only.

Levels. The overall intent of the program is to produce knowledge and prototypes of courseware for mathematical content usually addressed from kindergarten through grade 12. Applicants are free to propose work at the educational level, within the K-12 range, that they feel needs most attention or offers the best opportunity to exploit the information technologies or their talents. Projects will be selected to address a diversity of mathematical levels. In the present competition, projects should be concerned more with clear illustration of their approach than with the quantity or span of curriculum covered.

Future-Orientation. Since the price of information-handling technology can be expected to continue to decline, while the state of the art continues to advance, projects should design their materials for use with equipment that will be available and affordable by schools a few years hence. Proposals should not be limited in their vision to existing hardware. Since prototypes must eventually be used by learners and instructors in specific, real-life situations, projects should design their activities with a thorough understanding of the promise and problems of successful use in schools and other teaching and learning settings.

Special Concerns. Projects should take account of the following guidance as applicable:

- New technological aids to education may provide a means for improving the learning of mathematics by categories of students such as women, early adolescents, minorities, the physically handicapped, and older students re-entering secondary and post-secondary education -- often in the context of materials designed for general use.
- New technological aids, whatever their potential, must be used effectively by instructors and learners to achieve the desired improvements in teaching and learning.
- The increasing availability of computers and other information-handling devices on the job and in the home is having a number of effects on the mathematical skills that need to be mastered, such as lessening the need for speed in pencil and paper computation and increasing the need for facility in problem solving with computers.

- Information technology makes possible greater use of problems from everyday life and science in the teaching of mathematics at all educational levels. (This concern with applications to science, as noted below, requires scientific expertise in projects.) These and other strategies, such as the use of games and simulations, have often been found to make mathematics more interesting, less threatening and more easily learned and carried over into personal and occupational situations.

- Cognitive science and contemporary information-handling technology allow important improvements in assessing students' progress, e.g. individualized diagnoses of students' intellectual processes as an integral part of instruction.

Required Expertise. Projects will be expected to bring to bear appropriate combinations of expertise in mathematics and science, teaching at the level in question, creative and artful use of technology in instruction, knowledge of the processes involved in the understanding of mathematics and the solving of mathematical problems, knowledge of the cognitive sciences more generally, and theoretical and practical expertise in organization and management of instructional activities.

The two agencies have established procedures for administering this program jointly. It is expected that most grants will fall in the range $25,000 to $150,000 and that projects will be 12 to 18 months in duration. Proposals are invited from U.S. academic or non-academic profit or non-profit organizations or combinations thereof, including school systems, and minority-owned and women-owned firms.

DEADLINE FOR RECEIPT OF PROPOSALS:

February 14, 1980 August 19, 1980

II. PREPARATION OF FORMAL PROPOSALS

Intent to Submit Card

To facilitate our preparations for the review process, proposers are requested to complete and submit the Intent to Submit Card (back cover of this brochure) as soon as they have decided to submit a formal proposal.

Proposal Format

Formal proposals should contain the following elements, presented in the order indicated:

Cover Page
Project Summary
Budget Summary
Budget Explanation
Narrative
Other Commitments of Senior Personnel
Appendices
(See Appendix E for checklist)

Cover Page (See Appendix A)

The cover page must be prepared in the format prescribed in Appendix A. One copy must bear the two required signatures.

Project Summary (See Appendix B)

The summary is to be a clear and simple precis that accurately describes the proposed project. It should employ a minimum of technical terminology and be written so that a scientifically literate person can understand the use of Federal funds requested to support the project. State the objectives of the proposed project and the basic elements of the development plan. Provide as much detail as is possible within the space limitations of the form. Type this form single spaced (this is an exception to the general rule calling for double spacing throughout the proposal).

Budget Matters (Appendix C)

The Foundation requires a Summary Proposal Budget prepared in accordance with Appendix C. Sufficient travel funds should be included in proposal budgets to allow two visits of the Principal Investigator (and principal assistants if needed) to Washington, D.C., for agency-sponsored meetings.

In a separate "Budget Explanation" section, components of each major item in the budget should be identified and justified. The explanation should briefly state why an item is important and the basis on which the projected cost was estimated. Reviewers must be able to relate each budget item clearly and specifically to the activity it supports. The numbers of graduate students and post-doctoral fellows (if any) supported by the project and the fractional time they are employed should be specified in the budget explanation. While this program obviously requires the availability of information-handling technological capability, support of extensive equipment acquisition is not envisioned.

Narrative

The narrative must not exceed 30 double-spaced pages. Whenever concise wording, graphical presentation and other techniques would shorten the proposal, they should be employed. The narrative should include:

1. Description and Significance of Approach to be Developed. Provide a statement and description of the approach to be taken to the teaching and learning of mathematics using information-handling technology. Describe both the larger sequence or body of instructional activites envisioned, the examples to be developed in the proposed project, and their relationship to the Special Concerns on page 2. Be specific about what is expected to be available at the end of the grant. Explain the rationale for the approach, including the pedagogical problems and opportunites addressed, their importance, the need for and appropriateness of the use of technology, the account taken of previous successes and failures in the use of technology in instruction, and the likelihood of successful general use given this history of past successes and failures. Describe the intended audience for the project and how the project will influence the work of this audience.

Provide similar discussion of any associated research to be carried out and describe ways in which the present project or a later stage of the work can improve mathematical teaching and learning processes in schools and other teaching and learning settings.

2. Procedure. Describe the procedures to be followed in carrying out the project, and state why they were selected. Describe also the procedures to be used in evaluating the product as it is being developed. How will information obtained here be used to guide the project, to improve the final product, and to maximize the likelihood that the product will be usable, and in fact used, in school or in non-school settings?

Describe plans for making available, at various stages of their development, the software, courseware, and tests produced if the project is terminated at the end of the proposed grant and if it is continued with or without support from the NSF-NIE program. See Part VI: Inventions, Software and Copyrights.

3. Personnel Qualifications. The Principal Investigator should be the person primarily responsible for the preparation of the proposal and for directing the project. Briefly describe the education and experience of the Principal Investigator and other key staff, and relate these qualifications to the proposed project activities. Indicate how the skill mix of project staff fits anticipated project needs and the expertise called for on page 3. Include the vitae of all principal professional personnel in the appendix.

4. Organization and Management Plan. Specify the proposed structure for operating the project and the responsibilities of key personnel. This section must include a carefully thought out schedule of activities which identifies the project starting date (not to be before September 15, 1980, or March 15, 1981), termination date and other significant progress points. Use milestone charts and other graphic or verbal presentations which will serve best to clarify the process and timetable.

Other Commitments of Senior Personnel

Each proposal must list all current projects, in addition to the proposed project, to which senior personnel have committed a portion of their time (whether or not salary for the person involved is included in the budgets of the various projects). This information should include the titles and dates of current grants or contracts, the source of funds, annual budget levels, and the person-months devoted to each project by each of the senior personnel. The proposal must also provide analogous information for all other proposed projects which are being considered by, or which will be submitted in the near future to, other possible sponsors including other NSF programs. Concurrent submission of a proposal to other organizations will not prejudice its review by NSF and NIE.

No consultant shall be reimbursed as a direct cost under this award at a rate which exceeds the salary of a GS-18, which at the writing of these guidelines is $193 per day. Further, the consultant ceiling requirement is intended to apply to subcontracts.

Appendices

Appendices should be used in the manner prescribed. In addition, they may be used sparingly to provide background or supporting information. It should be kept in mind, however, that reviewers' time is limited, so voluminous appendices may not be studied carefully.

III. SUBMISSION OF PROPOSALS*

1. Fifteen (15) copies of the complete proposal are required.

2. Two (2) extra copies of the Cover Page and the Project Summary are required.

3. Copy must be typed double spaced on one side only of 8-1/2" x 11" paper. Typescript must be contained within a space 8" x 10-1/2". The Narrative section should not exceed 30 double-spaced pages.

4. Pages are to be numbered at the bottom.

5. Proposal copies are to be assembled in the order shown above, and stapled in the upper left hand corner, but not otherwise bound.

6. The original signed Cover Page is the only letter of transmittal needed or desired. Institutional letters of endorsement or transmittal, supporting letters, institutional forms, etc., if included, must be appended to the back of the proposal.

7. Proposals must be securely bound in a single package and either mailed to:

Central Processing Section
National Science Foundation
Washington, D.C. 20550
ATTN: Mathematics Education Using Information Technology

or hand-delivered to Room 223, NSF, 1800 G Street, N.W., Washington, D.C.

The proposals must be at NSF by 5:00 p.m., February 14, 1980, or August 19, 1980.

8. To facilitate prompt acknowledgment of the arrival of the package at the Foundation, the proposer should cut out two acknowledgment-of-receipt postcards from the back cover of this guide. Address one card to the Principal Investigator and the other to the official authorized to sign the Cover Page. Attach both to the Signature Copy of the Cover Page. When the package arrives, the date of receipt and an assigned proposal number will be stamped on the card before it is returned, so that thereafter the proposer and the Foundation may refer to this proposal number in correspondence. If receipt is not acknowledged within 2 weeks of submission, the program office should be contacted promptly at 202/282-7910.

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* See Check List for Proposal Submission in Appendix E.

IV. PROPOSAL EVALUATION

Method of Selection

Proposals will be reviewed by the staffs of the National Science Foundation and the National Institute of Education, assisted by persons in the appropriate mathematics, science, and education communities, in professional groups, and in relevant Federal agencies. When appropriate, individuals representing the public may be included as reviewers. Proposals will be selected for award which in the judgment of the staffs, offer the greatest potential for improving mathematics education. As noted above, the overall intent of the program is to produce prototypes of software, courseware, and tests covering the range from kindergarten through high school; and this intent will be a factor in the selection of projects to be supported in various phases of the program. In many cases, negotiation will be conducted. In cases of substantially equal merit, consideration may be given also to such factors as program balance, institutional diversity, geography, and appropriate demographic variables.

Evaluation Criteria

Formal proposals are evaluated according to merit as judged by the quality and significance of the projected results and of the design of activites to achieve those results. Reviewers will examine proposals and submit comments based on the criteria in Appendix G.

Reviews

Reviewers will be provided with a copy of the proposal, these Guidelines, and an evaluation form in connection with which they will be asked to address each of the above criteria individually. A copy of the evaluation form is in Appendix F.

V. OTHER CONSIDERATIONS

Assurance of Compliance with Civil Rights Act

If the applicant institution has not filed an Assurance of Compliance with Title VI of the Civil Rights Act of 1964 as required by NSF regulations, pertinent forms and a copy of the regulations may be obtained by writing to the Foundation's Division of Grants and Contracts. The required Assurance Form, when completed by the institution, should be submitted to the Division of Grants and Contracts. Once an Assurance Form has been submitted by the applicant organization, it covers all proposals subsequently submitted by any department or other unit of that organization. Individual Assurance Forms are not necessary for each application or for each proposal. If there is some question as to whether an institution has filed an Assurance of Compliance, the institution's business office should be consulted.

Grantee Organization and Management Data

If your organization has not received an NSF grant within the past 2 years, please fill out the Organization and Management Information card on the back of this brochure and mail it to the address indicated on the card.

Human Subjects

1. The protection of the rights and welfare of human subjects (including students) involved in research, development and related activities supported by NSF grants is the responsibility of the grantee.

2. The informed consent of the individual is a vital element in the protection of human subjects. Applicants are referred for guidance to CODE OF FEDERAL REGULATIONS, Title 45, Part 46, Protection of Human Subjects, Revised April 1, 1977, available from the Office for the Protection from Research Risks, National Institutes of Health.

3. Before a grant can be made, NSF must receive certification that research involving use of human subjects has been reviewed and approved by the appropriate Institutional Review Board at the grantee organization, and that the grantee assures NSF that it will comply with DHEW policies, as amended, regarding the use of human subjects. This statement must be received prior to the final processing of an award.

Pre-College Students and Experimental Curriculum Development Projects

Grantees of projects which involve pre-college students in research or development on, or the pilot-testing, evaluation, or revision of, experimental or innovative curriculum development projects will:

1. Provide to the school board, or comparable authority responsible for the schools considering participation in the project, information concerning the need for and purposes of the particular education project, the proposed content of the material to be used, the expected benefits to be derived, and other information to assist the jurisdiction in arriving at a decision on participation.

2. Obtain, after the responsible authority has carried out its procedures, written approval for participation in the project activities.

3. Provide information and materials to the responsible school authority to assist it in carrying out its own established procedures regarding the participation of students in project activities.

4. Provide information to the Foundation describing compliance with the above provisions.

5. Provide, in accord with NSF FY-1976 House Authorization Legislation (Public Law 94-86), in every publication, testing or distribution agreement involving instructional materials developed under a grant (including but not limited to teacher's manuals, textbooks, films, tapes or other supplementary material) that such material will be made available within the school district using such material for inspection by parents or guardians of children engaged in educational programs or projects of that school district.

Access to Peer Review Information

Verbatim copies of reviews, not including the identity of reviewers, will be provided to each prospective Principal Investigator when a decision has been made on the proposal.

Confidential Aspects of Proposals and Awards

When a proposal results in an award, it becomes a part of the record of the Foundation's transactions, available to the public upon specific request. Information that the Foundation and the grantee mutually agree to be of a privileged nature will be held in confidence to the extent permitted by law; therefore, any information that the applicant wishes to have the Foundation consider as privileged should be clearly marked as such and sent in a separate statement, two copies of which should accompany the proposal.

A proposal that does not result in an award may be retained by the Foundation. Such a proposal will be released only: (1) with the consent of the proposer; or (2) to the extent required by law. A proposal may be withdrawn at any time prior to final action thereon by the Foundation.

Indirect Costs

Each proposal may include indirect costs at the rate approved for the institution. Proposals should specify the institution's approved rate and, if different, the rate requested for the proposed activities. The approved rate and the base for the computation may be obtained from the business officer of the institution. That person should contact the Foundation's Division of Grants and Contracts, Cost Analysis Section, Award and Administration Branch if the organization does not have an approved rate; e.g., is a first-time applicant. If information is needed with regard to an approved rate, call 202/634-7545.

Contribution to Project Costs

NSF and NIE strongly encourage organizations submitting proposals to the NSF-NIE program on mathematics education using information technology to contribute to the costs of performing the development and research activities. NSF and NIE expect that grantees will share in the costs at a level which reflects their interest in the project, the potential benefits they may derive and their ability to cost-share.

Contracting or Transferring the Project Effort

Excluding the purchase of commercially available supplies, materials, equipment, or general support services allowable under the grant, none of the research or substantive effort under an NSF grant may be contracted or otherwise transferred to another organization without prior NSF approval. Normally, the intent to so contract is to be fully disclosed in the proposal submission, and evidence of NSF prior approval appears in the grant instrument. In the event that the need to so contract arises after a grant has been made, the grantee must submit to the NSF Grants Officer the proposed performance statement and budget, a statement indicating the basis for selection of the contractor, and a justification of the proposed arrangement. The request must be signed by the Principal Investigator and endorsed by the Authorized Organizational Representative. NSF approval will be indicated by letter from the Grants Officer.

NSF and NIE Evaluation of Programs

Proposers should be aware that NSF and NIE may, as part of their own program evaluation activities, carry out in-depth evaluations of selected awarded projects through independent third parties. Thus, proposers should be prepared to cooperate with any evaluators eventually retained by the agencies to analyze both the institutional context and the impact of any supported project.

VI. PROJECT AND AWARD MANAGEMENT

Grant Administration

Grants will be administered in accordance with the terms and conditions of the award instrument and established Foundation procedures which are described in the NSF Grant Policy Manual. This document, NSF Grant Policy Manual, Revised October, 1979, is for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C. 20402. Price $1.00 (single copy) $1.25 foreign. Subscription price: $7.50 per year.

An NSF grant is normally made to an organization, known as the grantee, rather than to the individual Principal Investigator who proposed to conduct the project. Notification of an award is made by letter signed by the NSF Grants Officer. The grant establishes a relationship between NSF and the grantee in which:

1. NSF agrees to provide financial support for the project to be performed under the provisions of the grant instrument.

2. The grantee agrees to the performance of the project, to the prudent management of the funds provided by the grant, and to the provisions of the grant instrument.

The grantee is free to accept or to reject the grant. Normally, the action to obtain Federal funds constitutes acceptance of a grant once it is made. However, in some cases, NSF may require written acceptance.

All written inquiries of a programmatic or technical nature should be directed to the NSF-NIE Mathematics Education and Technology Program at the National Science Foundation, Washington, D.C. 20550, or the National Institute of Education, Washington, D.C. 20208.

Incorporated into the grant letter is the approved budget, NSF F.L. 118, Grant General Conditions, and other special grant conditions. The grant provides authority to the grantee to commit funds for support of the project at any time between the effective date of the grant and the expiration date of the grant.

The Grant Period extends from the effective date of the award through the expiration date. It is that span of time during which the objectives of the project are to be achieved and the grant funds are available for appropriate obligation. This period intentionally is longer than the duration of the project in order to allow time for the preparation of reports after the project is concluded. The grant becomes effective on the date specified in the grant letter and expires on the date given in that letter. It is required that all commitments of grant funds be made during the Grant Period.

No-Cost Extensions

It is expected that projects will be completed within the time period specified in the award instrument. Therefore requests for no-cost extensions should be submitted only under the most unusual circumstances.

When the work is delayed, a no-cost extension may be requested. This request, along with a justification, must be received at the Foundation at least 45 days before the award expiration date, contain the signatures of both the Principal Investigator and the Authorized Institutional Representative, and include a summary of progress, a budget for use of the remaining funds, plans to complete the project, and an updated statement of Other Commitments of Senior Personnel.

Changes in Project Operation

Although major changes in the conduct of the project may be proposed at any time, changes in the scope, objectives, and professional personnel of the project must be approved in advance by the Foundation. Requests should be addressed to the Program Manager responsible for monitoring the project.

Inventions

Article 17 of the NSF Grant General Conditions, F.L. 118 which is incorporated as part of every NSF grant award, titled Rights to Inventions, governs the disposition of rights to patentable inventions made or conceived under the grant.

In summary, Article 17 provides that whenever an invention is conceived or first actually reduced to practice by the grantee or its employees in the course of a research grant, the grantee will furnish NSF with complete information thereon. Further, the Foundation will determine at the time of disclosure whether a patent application should be filed and the disposition of the invention and rights in any resulting application or patent. The text of Article 17 is quoted on the following page:

17. Rights in Inventions

a. Except as otherwise provided in the grant letter, or where an Institutional Patent Agreement has been executed with the grantee (unless the grant letter or the terms of IPA exclude the grant from the operation of the IPA), the following provisions will apply:

b. Whenever any invention that is, or may be, patentable is conceived or first actually reduced to practice in the course of or under this grant, the grantee shall furnish NSF with complete information thereon; and NSF shall have the right to determine whether or not and where a patent application shall be filed and to determine the disposition of the invention and title to and rights under any patent application or patent that may result. In making such a determination, NSF shall take into account the public interest and the equities of the grantee. In any case, NSF may arrange to have the invention described in a printed publication.

c. The grantee, for itself and for its employees, agrees that all documents will be executed and all other actions necessary or proper to carry out the determination of NSF will be taken.

d. Except as otherwise authorized in writing by the Grants Officer, the grantee shall insert in each subcontract having experimental, developmental, or research work as one of its purposes, provisions making this article applicable to the subcontractor and its employees.

e. Reports of inventions required under these provisions or requests for retention of rights in such inventions, as well as requests for guidance in these matters, should be addressed to the NSF Office of the General Counsel.

The full text of F.L. 118 may be obtained by writing Forms and Publications, National Science Foundation, Washington, D.C. 20550.

Software and Copyrights

Rights to computer software developed during the course of the project will be determined at the time of award, and terms designed to protect the public interest and the equities of the parties, will be negotiated with prospective awardees. Such terms will reserve certain rights for the Government to use the resulting software and will designate the extent to which other users may have access to the software as well as the rights that the grantee may acquire. NSF and NIE are particularly interested in assuring that resulting software will be available to educational institutions for research and educational purposes. Formal proposals should describe any pre-existing inventions or software.

Publications

The grantee or contractor is wholly responsible for the conduct of research and development activities, publication of the results therefrom, and the preparation of curricular materials. Neither NSF nor NIE, therefore, assumes responsibility for such findings, nor their interpretation, nor for the content of such curricular materials. Nevertheless, the Foundation retains the right to approve, in advance, the method of and plan for the distribution of such materials. For further information, request NSF Circular #123, "Implementing Publication/Distribution Agreements Relating to NSF-Supported Curriculum Materials," describing the procedures which are incorporated by reference in this announcement. Copies of NSF Circular #123 may be obtained by writing Forms and Publications, National Science Foundation, Washington, D.C. 20550.

Acknowledgment and Disclaimer

An acknowledgment of NSF and NIE support must be made in connection with the publication of any material based on or developed under a project supported by NSF and NIE to the effect that:

> "This research was supported by NSF Award No. XXX in the joint National Science Foundation--National Institute of Education Program on Mathematics Education Using Information Technology."

Any materials, books, monographs, proceedings of symposia, or similar publications supported by an award must contain a statement, immediately following the acknowledgment, that contains an expression of the following:

> "Any opinions, findings, conclusions or recommendations expressed (herein) are those of the author(s) and do not necessarily reflect the views of the National Science Foundation or the National Institute of Education."

Project Reporting Requirements

Interim Reports. Brief quarterly reports should be submitted covering such matters as (1) progress to date in comparison with the project schedule; (2) problems encountered and methods used in solving them; and (3) circumstances or considerations which might significantly affect subsequent phases of the project.

Quarterly reports should not include requests for NSF approval for major changes. Such requests should in all cases be the subject of separate correspondence.

Final Project Reports. (See Appendix D--Form 98A, Parts I and II.)

The requirements and instructions for final reports are summarized in the Final Project Report Form (NSF Form 98A), attached as Appendix D. Three completed copies of that form are to be submitted within 90 days after the expiration of the award to:

National Science Foundation
Division of Grants and Contracts
Award Accountability Branch
Washington, D.C. 20550

This office will automatically route copies (including any preprints or reprints) to the NIE and NSF program officers. The principal investigators should continue to submit three copies of preprints or publications resulting from the project after the expiration of the grant to the cognizant program officers. All reports and materials should be clearly labeled with the award number and other identifying information.

The technical description of the project (referenced in Part III, Form 98A) is intended to provide technical information to NIE and NSF program officers and to other researchers in this field to whom it may be distributed. It should contain a description of the objectives, methods and procedures, theories (if any), findings, and conclusions concerning the project. The technical description should be limited to 20 pages, and should be accompanied by an authorization from the principal investigator to reproduce and distribute it.

Substantive Technical Reports that describe research results, knowledge, or information of general utility and interest, but that will not appear in the periodical literature or be published by professional, commercial or other organizations, should be submitted to both the National Technical Information Service (NTIS) and the Education Resources Information Center (ERIC).

All Technical Reports submitted to NTIS should contain a completed ANSI Report Documentation Page (NTIS Form 35) and should be accompanied by one or more Accession Notice Cards addressed to the NSF Program Manager monitoring your project so that the program will have confirmation that the report was submitted. The NTIS Acquisition Number Technical Reports should be sent to:

Input Branch
National Technical Information Service (NTIS)
U. S. Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22161

In order to submit reports to ERIC, two copies should be sent to:

Educational Resources
  Information Center (ERIC)
4833 Rugby Avenue, Suite #303
Bethesda, Maryland 20014

Financial Report

A separate fiscal report is no longer required under an NSF award. The Foundation will use the expenditure data reported in the quarterly Federal Cash Transactions Report (formerly known as the Quarterly Expenditure Report) in lieu of a final fiscal report. The Foundation's computerized version of the Federal Cash Transactions Report is forwarded to each grantee institution in the month following the close of each calendar year. Procedures for reporting are forwarded to grantees at the time an NSF award is made.

Government Excess Property

NSF grantees are eligible to acquire government excess property (scientific equipment and supplies) through no-cost transfers from the Federal Government to the grantee institution. Those not acquainted with the procedure should request a copy of NSF Important Notice No. 58 and a supply of Form SF-122 from the Project Property Section, Division of Grants and Contracts, National Science Foundation, Washington, D.C. 20550. The total value of the property to be acquired under a grant is normally limited to the amount of the award.

APPENDIX A

PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION — NATIONAL INSTITUTE OF EDUCATION PROGRAM ON MATHEMATICS EDUCATION AND INFORMATION TECHNOLOGY

Cover Page

FOR CONSIDERATION BY NSF ORGANIZATIONAL UNIT (please specify)

NSF—NIE Program for Mathematics Education Using Information Technology

IS THIS PROPOSAL BEING SUBMITTED ELSEWHERE IN NSF OR TO ANOTHER FEDERAL AGENCY?

Yes ______ No ______

IF YES, EXPLAIN ON ATTACHED SHEET.

PROGRAM ANNOUNCEMENT/SOLICITATION NO.: **SE 80-59**

CLOSING DATE (circle one) **February 14, 1980 or August 19, 1980**

NAME OF SUBMITTING ORGANIZATION TO WHICH AWARD SHOULD BE MADE (INCLUDE BRANCH/CAMPUS/OTHER COMPONENTS)

ADDRESS OF ORGANIZATION (INCLUDE ZIP CODE)

TITLE OF PROPOSED PROJECT (Maximum 10 words)

REQUESTED FROM NSF:

Local Contribution: $

Total Project Cost: $

PERIOD OF PROJECT OPERATION:

Starting Date:

Duration in months:

PRINCIPAL INVESTIGATOR & SOCIAL SECURITY NUMBER*
(Dr., Prof., Mr., Ms.) (Name only one person)

PI PHONE NO. Area Code:

Office:

Home:

PI DEPARTMENT

DISCIPLINE

PI ORGANIZATION

TARGET POPULATION (Check all that apply): ☐ Older than 18 years ☐ Younger than six years ☐ 6-9 years ☐ 10-14 years ☐ 15-18 years

TYPE OF INSTITUTION: ☐ Public School System ☐ Private School System ☐ Other ☐ Public University ☐ Private University ☐ Non-Profit Corp. ☐ For-Profit Corp.

*Submission of social security numbers is voluntary and will not affect the organization's eligibility for an award. However, they are an integral part of the NSF information system and assist in processing the proposal. SSN solicited under NSF Act of 1950, as amended.

PRINCIPAL INVESTIGATOR	AUTHORIZED ORGANIZATIONAL REP.	OTHER ENDORSEMENT (optional)
NAME (Dr., Prof., Mr., Ms.)	NAME (Dr., Prof., Mr., Ms.)	NAME (Dr., Prof., Mr., Ms.)
SIGNATURE	SIGNATURE	SIGNATURE
TITLE	TITLE	TITLE
DATE	DATE	DATE

APPENDIX B

NOTICE OF DEVELOPMENT PROJECT

SCIENCE INFORMATION EXCHANGE

SMITHSONIAN INSTITUTION

National Science Foundation — National Institute of Education

PROJECT SUMMARY

PROJECT NO. (Do not use this space)

NSF AWARD NO.

1. NAME OF INSTITUTION (INCLUDE BRANCH/CAMPUS & SCHOOL OR DIVISION)

2. MAILING ADDRESS

3. PRINCIPAL INVESTIGATOR AND FIELD OF SCIENCE/SPECIALTY

4. MAJOR DISCIPLINE CODE (See Below)*

5. SPECIFIC SUBJECT(s) OR TOPIC(s):

6. TITLE OF PROJECT (10 words or fewer)

7. SUMMARY OF PROPOSED WORD (Limit to 22 pica or 18 elite typewritten lines)

FOR NSF USE ONLY

DIVISION (OFFICE) AND DIRECTORATE **SCIENCE EDUCATION DEVELOPMENT & RESEARCH**	PROGRAM (NSF-NIE Program on Mathematics Education Using Information Technology)	
SECTION	PROPOSAL NO.	F.Y.

FOR DGC USE ONLY

START AND END DATES	AMOUNT GRANTED

***Major Discipline Classification:** Please classify the proposal according to the following major group(s). The appropriate code should appear on line 4 of the Project Summary Form.

BZ	(Biology): subjects in category of "Life Sciences."
CH	(Chemistry)
EZ	(Earth Sciences)
IN	(Inter- and Multidisciplinary Sciences)
MA	(Mathematics): other than Computer Science
PY	(Physics): includes Physical Sciences
SZ	(Social Sciences): subjects in category of "Social Science"
ZZ	(Other Sciences)

APPENDIX C

SUMMARY
PROPOSAL BUDGET

	FOR NSF USE ONLY	
ORGANIZATION AND ADDRESS	PROPOSAL NO.	
	DURATION (MONTHS)	
PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR	PROPOSED	REVISED

NSF USE	A. SENIOR PERSONNEL (LIST BY NAME; SHOW NUMBERS OF PEOPLE IN BRACKETS; SALARY AMOUNTS MAY BE LISTED ON SEPARATE SCHEDULE) GPM 205.1b	NSF FUNDED MAN MONTHS			FUNDS REQUESTED BY PROPOSER	FUNDS GRANTED BY NSF (IF DIFFERENT)
		CAL.	ACAD.	SUMR.		
	1. P.I./P.D.				$	$
	2. CO P.I./P.D.				$	$
	3. CO P.I./P.D.				$	$
	4. CO P.I./P.D.				$	$
	5. CO P.I./P.D.				$	$
11115	6. ( ) ← SUBTOTALS A1 - A5 →				$	$
	FACULTY AND OTHER SENIOR ASSOCIATES (ATTACH EXTRA SHEET IF NECESSARY)					
	7.				$	$
	8.				$	$
	9.				$	$
	10.				$	$
	11.				$	$
11117	12. ( ) ← SUBTOTALS A7 - A11 →				$	$
	B. OTHER PERSONNEL (LIST NUMBERS IN BRACKETS)					
11141	1. ( ) POSTDOCTORAL ASSOCIATES				$	$
11149	2. ( ) OTHER PROFESSIONALS				$	$
11150	3. ( ) GRADUATE STUDENTS				$	$
11152	4. ( ) UNDERGRADUATE STUDENTS				$	$
11182	5. ( ) SECRETARIAL - CLERICAL				$	$
11183	6. ( ) TECHNICAL, SHOP, OTHER				$	$
	TOTAL SALARIES AND WAGES (A+B)				$	$
11200	C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				$	$
	TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A+B+C)				$	$
	D. EQUIPMENT (LIST ITEMS AND DOLLAR AMOUNTS FOR EACH ITEM)					
23181	TOTAL EQUIPMENT				$	$
	E. MATERIALS AND SUPPLIES					
32630					$	$
	F. DOMESTIC TRAVEL					
42111					$	$
	G. FOREIGN TRAVEL (LIST DESTINATION AND AMOUNT FOR EACH TRIP; GPM 731)					
42112					$	$

PAGE 1 OF 2 PAGES

SUMMARY PROPOSAL BUDGET

PROPOSAL NO.

52500	H. PUBLICATION COSTS/PAGE CHARGES	$	$
62315	I. COMPUTER (ADPE) SERVICES	$	$
	J. CONSULTANT SERVICES (IDENTIFY CONSULTANTS BY NAME AND AMOUNT; GPM 516)	▨ $	▨ $
	K. PARTICIPANT SUPPORT COSTS, IF ALLOWED BY PROGRAM GUIDE (ITEMIZE) GPM 518	▨	▨
	1. STIPENDS $	▨	▨
	2. TRAVEL $	▨	▨
	3. SUBSISTENCE $	▨	▨
	4. OTHER - SPECIFY $	▨	▨
	5. TOTAL PARTICIPANT COSTS (K1 + K2 + K3 + K4)	$	$
	L. ALL OTHER DIRECT COSTS (List items and dollar amounts. Details of subcontracts, including work statements and budget, should be explained in full in proposal.) $ $ $ $	▨	▨
65001	TOTAL OTHER DIRECT COSTS	$	$
	M. TOTAL DIRECT COSTS (A THROUGH L)	$	$
	N. INDIRECT COSTS (Specify rate(s) and base(s) for on/off campus activity. Where both are involved, identify itemized costs included in on/off campus bases in remarks.)	▨	▨
74100	TOTAL INDIRECT COSTS	$	$
	O. TOTAL DIRECT AND INDIRECT COSTS (M + N)	$	$
74500	P. LESS RESIDUAL FUNDS (If for further support of current project; GPM 252 and 253)	$	$
75000	Q. AMOUNT OF THIS REQUEST (O MINUS P)	$	$

REMARKS

NOTE: SIGNATURES REQUIRED ONLY FOR REVISED BUDGET (GPM 233). THIS IS REVISION NO.

SIGNATURE OF PRINCIPAL INVESTIGATOR/PROJECT DIRECTOR	DATE OF SIGNATURE	TYPED OR PRINTED NAME AND TITLE
SIGNATURE OF AUTHORIZED ORGANIZATIONAL REPRESENTATIVE	DATE OF SIGNATURE	TYPED OR PRINTED NAME AND TITLE

FOR NSF USE ONLY

INDIRECT COST RATE VERIFICATION			PROGRAM OFFICER APPROVAL
Date Checked	Date of Rate Sheet	Signature	

Grant Number	Amend No.	Institution	Organization	Fund Acct.	Program	Object	

	Proposal Number	Dur.	Chg.	Award Date	Proposed Amount	Prop. Dur.	

PAGE 2 OF 2 PAGES

APPENDIX D

NATIONAL SCIENCE FOUNDATION
Washington, D.C. 20550

FINAL PROJECT REPORT
NSF FORM 98A

PLEASE READ INSTRUCTIONS ON REVERSE BEFORE COMPLETING

PART I–PROJECT IDENTIFICATION INFORMATION

1. Institution and Address	2. NSF Program	3. NSF Award Number
	4. Award Period From To	5. Cumulative Award Amount

6. Project Title

PART II–SUMMARY OF COMPLETED PROJECT *(FOR PUBLIC USE)*

PART III–TECHNICAL INFORMATION *(FOR PROGRAM MANAGEMENT USES)*

1. ITEM *(Check appropriate blocks)*	NONE	ATTACHED	PREVIOUSLY FURNISHED	TO BE FURNISHED SEPARATELY TO PROGRAM	
				Check (✓)	Approx. Date
a. Abstracts of Theses					
b. Publication Citations					
c. Data on Scientific Collaborators					
d. Information on Inventions					
e. Technical Description of Project and Results	▨				
f. Other *(specify)*	▨				

2. Principal Investigator/Project Director Name *(Typed)*	3. Principal Investigator/Project Director Signature	4. Date

NSF Form 98A (5-78) Supersedes All Previous Editions

Form Approved OMB No. 99R0013

INSTRUCTIONS FOR FINAL PROJECT REPORT
(NSF FORM 98A)

This report is due within 90 days after the expiration of the award. It should be submitted in two copies to:

National Science Foundation
Division of Grants and Contracts
Post-Award Projects Branch
1800 G Street, N.W.
Washington, D.C. 20550

INSTRUCTIONS FOR PART I

These identifying data items should be the same as on the award documents.

INSTRUCTIONS FOR PART II

The summary (about 200 words) must be self-contained and intelligible to a scientifically literate reader. Without restating the project title, it should begin with a topic sentence stating the project's major thesis. The summary should include, if pertinent to the project being described, the following items:

- The primary objectives and scope of the project.
- The techniques or approaches used only to the degree necessary for comprehension.
- The findings and implications stated as concisely and informatively as possible.

This summary will be published in an annual NSF report. Authors should also be aware that the summary may be used to answer inquiries by nonscientists as to the nature and significance of the research. Scientific jargon and abbreviations should be avoided.

INSTRUCTIONS FOR PART III

Items in Part III may, but need not, be submitted with this Final Project Report. Place a check mark in the appropriate block next to each item to indicate the status of your submission.

a. Self-explanatory.
b. For publications (published and planned) include title, journal or other reference, date, and authors. Provide two copies of any reprints as they become available.
c. Scientific Collaborators: provide a list of co-investigators, research assistants and others associated with the project. Include title or status, e.g. associate professor, graduate student, etc.
d. Briefly describe any inventions which resulted from the project and the status of pending patent applications, if any.
e. Provide a technical summary of the activities and results. The information supplied in proposals for further support, updated as necessary, may be used to fulfill this requirement.
f. Include any additional material, either specifically required in the award instrument (e.g. special technical reports or products such as films, books, studies) or which you consider would be useful to the Foundation.

APPENDIX E

Check List for Proposal Submission

Complete proposals help to expedite the review process and assist the applicant in meeting program requirements. The following check list is provided as an aid to assuring proposal completeness.

☐ Complete and mail Intent to Submit card (back cover)
☐ Cover Page (all items completed on requested format, Appendix A)
☐ Affix required signatures (Principal Investigator & Authorizing Official)
☐ Project Summary (use requested format, see Appendix B)
☐ Budget (see Appendix C)
☐ Narrative (double-spaced, 30 pages maximum, numbered at bottom)
☐ Other Commitments of Senior Personnel
☐ Vitae of Senior Personnel (put into Appendix)
☐ Review for protection of human subjects
☐ Equipment certification if any item exceeds $10,000
☐ Written approval from responsible authority for pre-college students' participation in project activities
☐ Complete Acknowledgement Cards (back cover)
☐ Two (2) extra copies of Cover Page and Project Summary

APPENDIX F

NATIONAL SCIENCE FOUNDATION—NATIONAL INSTITUTE OF EDUCATION	**PROPOSAL EVALUATION REPORT**

PROPOSAL NO.	PROGRAM MANAGER	PROGRAM BROCHURE **NSF—NIE MATHEMATICS EDUCATION USING INFORMATION TECHNOLOGY**
PROJECT DIRECTOR	INSTITUTION	PLEASE RETURN BY

Verbatim but anonymous copies of reviews will be sent only to the principal investigator/project director on request. Subject to this NSF policy and applicable laws, including the Freedom of Information Act, 5 USC 552, reviewers' comments will be given maximum protection from disclosure.

NARRATIVE COMMENTS (Continue on additional sheets--front side only--if necessary)

PLEASE BE SURE TO CHECK ONE BOX

☐ I RECOMMEND THAT THE FOUNDATION AWARD SUPPORT FOR THIS PROJECT SUBSTANTIALLY AS PROPOSED.

☐ I RECOMMEND THAT THE FOUNDATION AWARD SUPPORT FOR THIS PROJECT SUBJECT TO ATTENTION BEING GIVEN TO RESOLVING THE WEAKNESSES NOTED.

☐ I RECOMMEND THAT THE FOUNDATION NOT AWARD SUPPORT FOR THIS PROJECT.

PLEASE COMPLETE SUMMARY SHEET

REVIEWER'S NAME	REVIEWER'S SIGNATURE

INSTITUTIONAL AFFILIATION

NSF FORM 989 (3-77)

PAGE 1

PROPOSAL NO.	PROGRAM MANAGER	PROGRAM BROCHURE DISE/SEDR
PROJECT DIRECTOR	INSTITUTION	PLEASE RETURN BY

SUMMARY

MAJOR STRENGTHS	MAJOR WEAKNESSES AND SUGGESTIONS FOR IMPROVEMENTS
REVIEWER'S NAME	REVIEWER'S SIGNATURE
INSTITUTIONAL AFFILIATION	

APPENDIX G

EVALUATION CRITERIA

Formal proposals are evaluated according to the quality, merit and significance of the projected results and of the design of activities to achieve those results. Reviewers will examine proposals and submit comments based on the following criteria:

1. Quality. Does the conceptualization of the problem or opportunity and the proposed solution show imagination and creativity? Are resources of high quality to be employed in attacking the problem? Would the promised results significantly improve mathematics education? Does the activity have high intrinsic merit? Is the content involved good mathematics? If science is also involved, is it good science?

2. Rationale. Are the project objectives clear and relevant to the goals of the program? Has the proposal identified an important need, problem or opportunity in mathematics education--is this a good idea? Have the developers demonstrated knowledge of the mathematics, the science and the pedagogy that is pertinent, current, and reasonably complete? Is the rationale supporting the project adequate to justify the investment of Federal funds? Is there an appropriate Federal role in supporting this activity? Has the proposal discussed the history of past successes and failures in the use of technology in instruction and shown how the proposed project has taken it into account?

3. Special Concerns. Does the project address, where applicable, the special needs of women, early adolescents, minorities, the physically handicapped or older students? To what extent is the project concerned with the successful adaptation of new technology in the classroom?

4. Project Design. Does the proposal articulate a well-formulated plan of attack on the problem identified? Is the proposed approach likely to be a practical and effective way to solve the problem? Are the management plan and the dissemination plan well conceived?

5. Impact. Would successful completion of this project provide the basis for significant difference in mathematics education? Will the product be easily used in its intended environment? Are the expected results, products, or outcomes sufficiently novel so as not to unnecessarily duplicate other efforts? Does the project capitalize in a timely way upon current or impending developments and trends in its field? Would the project provide an effective demonstration of the use of information technology in mathematics education? Are the intended audiences clearly identified and the means to influence the activities of these audiences clearly described?

6. Evaluation. Are there good procedures for evaluation? Will the activity provide information that will be useful to others working in similar areas?

7. Personnel and Institutional Resources. Is the staff well qualified to carry out the roles assigned to them? Are there any serious personnel gaps unrecognized or unfilled, given the discussion of "required expertise" on page 3?

8. Budget. Are the costs of the project--salaries, services, and other expenses--reasonable? Does the budget reflect a realistic assessment of the magnitude of the task?

9. Institutional Contribution. Has the institution contributed resources to the project?

90%